DISCUSSION OF THE AMENDMENT

Claims 1-8 are pending. Applicants have elected Claims 5-8 for further prosecution. Upon entry of the amendment, New Claims 9-17 are added. New Claim 9 is similar to original Claim 5, in which a side-by-side comparison of the text is present below.

New Claim 9	Original Claim 5
A method for manufacturing a membrane electrode assembly for a solid polymer type fuel cell comprising: applying a catalyst electrode layer directly to a porous gas diffusion layer to obtain an intermediate lamination layer body, wherein the catalyst electrode layer comprises a mixture of an electrolyte polymer having ion conductivity and a conductive miniature body comprises a catalyst, and wherein the porous gas diffusion layer comprises carbon cloth or carbon paper having electrically conductive particles and water repellant particles dispersed throughout the layer; heat treating the intermediate lamination layer body at a temperature range equal to or higher that glass-transition temperature of the electrolyte polymer and equal to or lower than the thermal decomposition temperature to obtain a lamination layer body; and then forming the membrane electrode assembly by hot pressing an electrolyte membrane having ion conductivity and the lamination layer bodies arranged both sides of the electrolyte membrane.	A method for manufacturing a membrane electrode assembly for a solid polymer type fuel cell comprising: a process for forming an intermediate lamination layer body by laminating a catalyst electrode layer formed with a mixture of an electrolyte polymer having the ion conductivity and a conductive miniature body including a catalyst on a porous gas diffusion layer; a process for hot pressing for forming a membrane electrode assembly by unifying an electrolyte membrane having the ion conductivity and the intermediate lamination layer bodies arranged both sides of the electrolyte membrane; wherein the intermediate lamination layer body is heat treated by maintaining heating at a temperature range equal to or higher that glass-transition temperature of the electrolyte polymer included in the catalyst electrode layer and equal to or lower than the thermal decomposition temperature before the process of hot pressing under a condition that the electrolyte membrane is not laminated on the intermediate lamination layer body.

New Claims 11-13 are supported by original Claims 6-8, respectively. New Claim 14 is supported by the text on page 4, line 33 – page 5, line 13 by way of calculation (i.e., weight percent of water repellant particles (PTFE) relative to the total weight of PTFE and electrically conductive particles (carbon black)). Support for Claims 15-16 is found on page 18, lines 6-8, while support for Claim 17 is found on page 1, lines 27-28. No new matter is believed to be added upon entry of the amendment. Upon entry of the amendment, Claims 9-17 will be active.

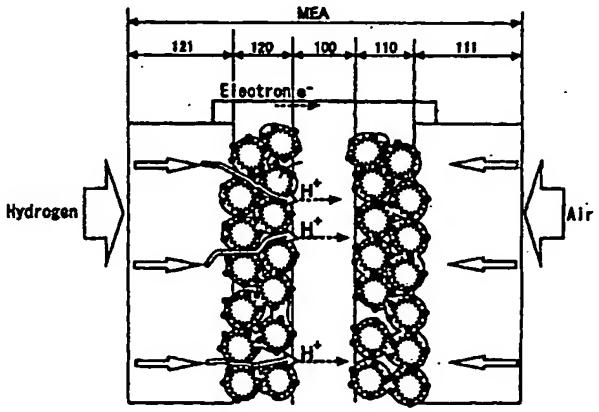
REMARKS

Applicants thank Examiner Goff for conducting the kind and courteous discussion with Applicants' representative, Daniel R. Evans, on December 16, 2005. The content of the discussion is reflected in the amendments to the claims and the following remarks.

An aspect of the present invention is directed to a method for manufacturing a membrane electrode assembly for a solid polymer fuel cell, in order to reduce a decline of excessive output potential during extended power generation and to reduce the deterioration of the membrane electrode assembly.

As shown in Fig.1 (*cf.* Fig. 3 of the present application), a membrane electrode assembly (MEA) of a solid polymer type fuel cell includes a catalyst electrode layer **110** for an oxidant electrode on a first side of an electrolyte membrane **100** having ion conductivity, a catalyst electrode layer **120** for a fuel electrode on a second side of the electrolyte membrane **100**, a gas dispersion layer **111** for the oxidant electrode on an outer side of the catalyst electrode layer **110** for the oxidant electrode, and a gas dispersion layer **121** for the fuel electrode on the outer side of the catalyst electrode layer **120** for the fuel electrode. The membrane electrode assembly highly influences the power generation performance of the solid polymer type fuel cell.

Fig. 1



Conventionally, the entire MEA is obtained by the following process. The catalyst electrode layers **110, 120**, which comprise a mixture primarily including electrolyte polymer solution having ion conductivity and carbon miniature bodies having catalyst are laminated on the electrolyte membrane **100** having ion conductivity to form an intermediate lamination body. Thereafter, the gas dispersion layers **111, 121** are positioned on opposing sides of the intermediate lamination body in the thickness direction to be formed as one unit by hot pressing. A drawback to this process is that unitary combination of the diffusion layers **111, 121** and the intermediate lamination body by hot pressing results in a reduction of the interface resistance between the electrolyte membrane **100** and the catalyst electrode layers **110, 120**.

With the conventional solid polymer type fuel cell, the water is generated by the power generation reaction on the oxidant electrode side (**110|111**). In addition, the fuel gas (e.g., gas including hydrogen) and oxidant gas (e.g., air including oxygen) may be humidified, because the power generation performance declines if the electrolyte membrane **100** becomes excessively dry. In the above-noted conventional MEA, the electrolyte polymer included in the catalyst electrode layers **110, 120** may not be sufficiently held in place and may become separated from the catalyst electrode layers by the generated water or the humidifying water generated through the power generation reaction. This results in a deterioration of the membrane electrode assembly, which in turn results in a reduction of the output potential of the solid polymer type fuel cell.

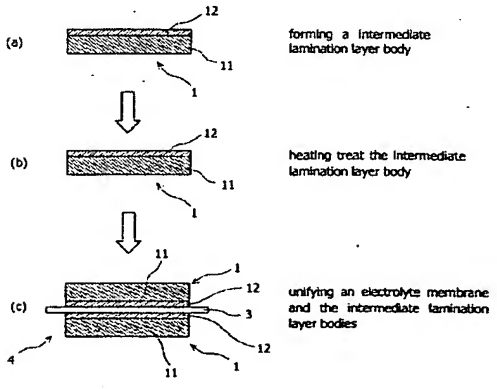
Thus, the present invention seeks to overcome the problems associated with the conventional method in order to increase the integrity of the MEA and thus reduce the decline of the excessive output potential during the long hour power generation.

The rejection of Claim 5-8 under 35 U.S.C. § 102(b), or in the alternative under 35 U.S.C. § 103(a), over the disclosure of U.S. Patent Application No. 2002/0098407 (US '407) is respectfully traversed.

The processes of the present application are distinguishable from the process disclosed in US '407 because the steps involved in the presently claimed processes give rise to a physically different MEA. For example, an MEA prepared by the processes of the present application contain five layers (see Fig. 1 above), in which the gas porous layer **111** has both electrically conductive particles and water repellant particles dispersed throughout the layer. This is unlike the seven-layered MEA prepared according to US '407 (see Fig. 2 on page 13 of the present response), in which the gas porous layer **11** has electrically conductive particles and water repellant particles coated on the surface of the layer having a slight amount dispersed near the surface thereof. In order to appreciate the differences between the presently claimed processes and the process disclosed in US '407, Applicants ask that the Examiner consider the following information in view of Figs. A and B.

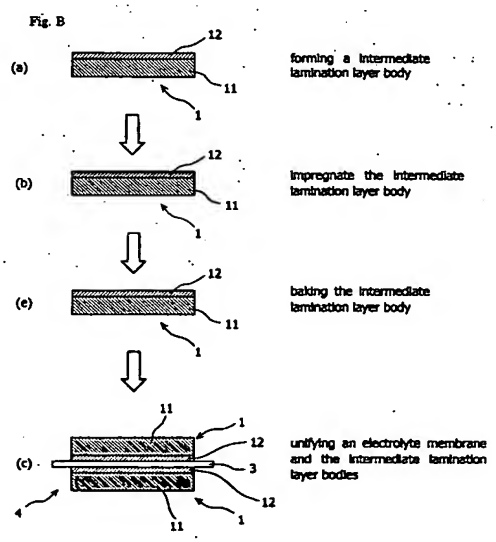
Present Application

Fig. A



US '407

Fig. B



US '407 discloses a process for forming an intermediate lamination body by laminating a catalyst electrode layer **12** on a porous gas diffusion layer **11** and a process for hot pressing for forming a membrane electrode assembly by unifying an electrolyte and the intermediate lamination layer bodies arranged both sides of the electrolyte membrane. US '407 also discloses that the porous gas diffusion layer **11** contains two layers: (i) a first layer containing a porous carbon substrate (see US '407, paras. 19-21, and Fig. 1 (**1** and **1'**)) having been surface treated with PTFE (see US '407, ¶ 47, lines 1-5) and (ii) a carbon layer made of a fluororesin and carbon black that is formed on the surface of the porous carbon substrate (see US '407, ¶¶ 22-25, Fig. 1 (**2** and **2'**), and ¶ 47, lines 5-10). The carbon layer is an intervening layer between the porous carbon substrate **1** and the catalyst electrode layer **12**. Thus, the components of the carbon layer infiltrate to some degree the surface of the porous carbon substrate (see US '407, ¶¶ 23 and 47). US '407 then discloses depositing a catalyst layer **12** on the carbon layer, in which the catalyst layer **12** contains a perflurocarbon polymer having ion exchange capacity and platinum supported carbon (see US '407 at ¶ 48). After drying, US '407 impregnates the intermediate lamination layer body with a solution containing the solvent-soluble fluorine-containing polymer having no ion exchange groups before baking at a temperature of 100°C to 200°C (see US '407 at ¶¶ 28 and 49). In other words, US '407 discloses forming the intermediate lamination layer body **1** with a solution containing the solvent-soluble fluorine-containing polymer having no ion exchange group (Fig. B(b)), baking the intermediate lamination layer body **1** (Fig. B(c)), and forming the membrane electrode assembly **4** by unifying the electrolyte membrane **3** and the intermediate lamination layer bodies **1** (Fig. B(d)).

On the other hand, as shown in Fig. A, Applicants' processes form an intermediate lamination layer body **1** by laminating a catalyst electrode layer **12** on a porous gas diffusion layer **11** that comprises carbon cloth or carbon paper having electrically conductive particles

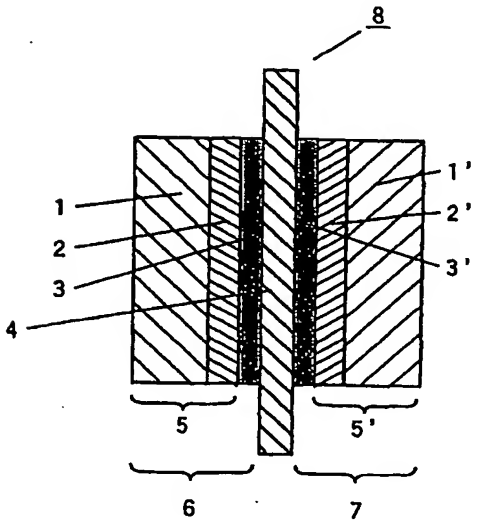
and water repellant particles dispersed throughout the layer (Fig. A(a)). The intermediate lamination layer body **1** undergoes heat treatment by maintaining a temperature range equal to or higher than the glass-transition temperature of the electrolyte polymer included in the catalyst electrode layer and equal to or lower than the thermal decomposition temperature (Fig. A(b)), and form the membrane electrode assembly **4** by unifying an electrolyte membrane **3** and the intermediate lamination layers bodies **1** (Fig. A(c)). Applicants heat treat the intermediate lamination layer bodies **1** for restraining the effusion of the electrolyte polymer at the usage of the solid polymer type fuel cell (see application text, page 16, lines 7-11). Applicants do not impregnate the intermediate lamination layer body **1** with a solution containing the solvent-soluble fluorine-containing polymer having no ion exchange group immediately before the heat treatment of the intermediate lamination layer body **1**. Accordingly, Applicants can joint the catalyst electrode layer **12** and the electrolyte membrane **3** with no inhibition of ion conductivity.

This is in contrast with that which is disclosed in US '407, because the step of coating the intermediate lamination layer body, which is unlike that which is presently claimed, with the fluorine-containing polymer having no ion exchange group is formed on the catalyst electrode layer **12** and results in a reduction of ion conductivity between the catalyst electrode layer **12** and the electrolyte membrane.

Accordingly, Applicants believe that the presently claimed process, as manifested in Claims 5-8, is both novel and unobvious over the process disclosed and suggested in US '407. Applicants respectfully request that the Examiner acknowledge the same and withdraw this rejection.

As noted above, US '407 discloses a process for producing a solid polymer fuel cell that is unlike that of the present invention. It is requested that the Examiner compare Figure 2 below, which is a reproduction of Fig. 1 shown in US '407.

Figure 2



№	Description
1, 1'	carbon cloth subjected to a surface treatment by PTFE (p. 5, ¶ 47)
2, 2'	carbon layers containing carbon black and PTFE (p. 5, ¶ 47)
3, 3'	catalyst layer containing an ion exchanging perfluoropolymer and platinum supported on carbon (p. 5, ¶ 48)
4	ion exchange membrane (p. 5, ¶ 51)
5, 5'	gas diffusion layers (p. 5, ¶ 47)
6	anode (p. 5, ¶ 49)
7	cathode (p. 5 ¶ 50)
8	electrode membrane assembly (p. 5, ¶ 51)

The process of Claim 9 is directed to the production of a five-layered membrane assembly, while the process disclosed in US '407 produces a seven-layered membrane assembly. The two extra layers disclosed in US '407 (**2** and **2'**) provide a membrane assembly unlike that which is produced in Claim 9. Additionally, layers **111** and **121** (see Fig. 1 above) are unlike **1** and **1'** because the former have both electrically conductive particles and water repellant particles dispersed throughout the layers, while the latter have only water repellant particles. It may be true that US '407 has a carbon layer containing a fluororesin and carbon particles that is applied to the surface of the porous carbon layer and is partially dispersed only near the surface thereof; however, this unlike that which is presently claimed.

In view of these differences, it is believed that the process claimed in Claim 9 and dependent Claims 10-17 are both novel and unobvious over the process disclosed in US '407.

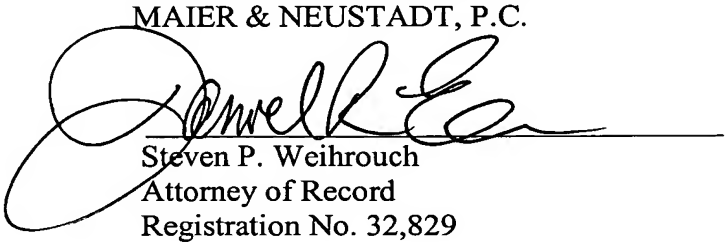
It is respectfully requested that the Examiner acknowledge the same and withdraw this rejection.

An **Information Disclosure Statement** is filed concurrently herewith, which cites two references (JP 03-208260 and JP 11-224679) that are disclosed on page 2 of the specification. It is respectfully requested that the Examiner acknowledge consideration of these references, and provide an indication of the same in the next office communication.

In view of the amendments to the claims and the discussion contained herewith, it is believed that the present application is now in a condition for allowance. Should the Examiner deem that a personal or telephonic interview would be helpful in advancing this application toward allowance, he is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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